DOCUMENT RESUME

ED 308 212 TM 013 535

AUTHOR Heath, Robert W.; And Others
TITLE Development of the Home Learning Environment Profile.
INSTITUTION Kamehameha Schools/Bernice Pauahi Bishop Estate, Honolulu, HI.
SPONS AGENCY Health Resources and Services Administration (DHHS/PHS), Rockville, MD. Office for Maternal and Child Health Services.
PUB DATE Apr 88
GRANT MCJ-153565-02-0; MCJ-157001-01
NOTE 70p.
PUB TYPE Reports - Research/Technical (143) -- Tests/Evaluation Instruments (160)

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS Academic Achievement; Cultural Context; Educational Assessment; *Educational Environment; *Family Environment; Interviews; Parent Child Relationship; *Predictive Validity; *Preschool Children; Preschool Education; Rating Scales; Socioeconomic Influences; *Test Construction; Test Reliability; Test Validity; Time Factors (Learning)
IDENTIFIERS Hawaii; *Home Learning Environment Profile

ABSTRACT

The development and validation of the Home Learning Environment Profile (HLEP) are outlined. The HLEP instrument was designed to assess successful preschool home educational programs for Hawaiian families. The instrument covers sociodemographic, cultural, and environmental factors of Hawaiian families. After an extensive review of published instruments, an interdisciplinary team of researchers and program developers was formed to draft and pilot the interview instrument. Item and cluster analyses and reliability computations were preformed for 42 female and 41 male children enrolled in Kamehameha Schools' (Hawaii) preschools. Seven scales were derived to assess home learning experience, parental responsibility for teaching, parental expectations, educational engagement, child autonomy, reported time allocated by the child to 10 home activities, and time allocated to preferred home activities out of the 10 specified. The most interesting finding of this research is that a rigorous assessment of home environment variables can be as predictive of educational achievement of young children as are individually administered intelligence tests. HLEP scales correlate differentially with tests of verbal, quantitative, and psychomotor skills. These findings indicate that intelligence test scores and status measures, such as socioeconomic status and birth order, represent predictive dead ends. Eighteen data tables and two bar graphs are included. (TJH)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED308212

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

✓ This document has been reproduced as received from the person or organization originating it.

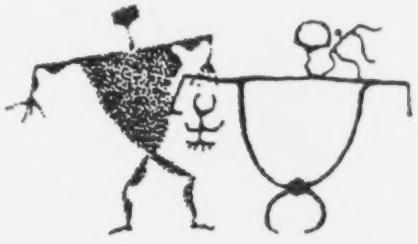
☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

ROBERT W. HEATH

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."



Development of the Home Learning Environment Profile

Robert W. Heath, Paula F. Levin,

and Katherine A. Tibbetts

Center for Development of Early Education

Kamehameha Schools/Bernice Pauahi Bishop Estate

Honolulu, Hawai'i

April 1988

To appear as a chapter in: Roberts, R. (Ed.) (In press). The learning environments of young children at-risk. Norwood, NJ: Ablex.

BEST COPY AVAILABLE

TM013535

ACKNOWLEDGEMENTS

We would like to thank our colleagues at the Center for Development of Early Education for their generous assistance. They helped at many stages of the instrument development process, from reviewing draft items through scale analysis and interpretation.

We particularly thank Gwen Akina for her patient retyping of the many versions of the instrument and reports, Mahealani McClellan for her work in data collection, Jerald Plett for his help with the computer files and proof reading, Richard Roberts for his unstinting encouragement to this project, and Wendie Yumori for sharing her time and knowledge of scaling techniques.

The work reported here was supported in part by funds from Grant #MCJ-153565-02-0 (year 3) and Grant #MCJ-157001-01 from the Division of Health and Human Service, Maternal Child Health Branch.

CONTENTS

I. INTRODUCTION 1

II. EXISTING INSTRUMENTS 7

III. METHODS 15

A. An interdisciplinary team 15

B. Home learning environment 16

C. Domain definition 17

D. Pilot and field-testing 20

E. Item and cluster analyses 22

IV. RESULTS 41

V. DISCUSSION 63

REFERENCES 67

I. INTRODUCTION

Research on the topic of home and family influence on educational achievement has been reviewed extensively by Scott-Jones (1984), Clark-Stewart (1978), and Goodson and Hess (1978). Also, two recent anthologies (Laosa & Siegel, 1982; Leichter, 1974) provide good summaries of our state of knowledge in the field. Most of this research has employed intensive interview or observational methods to assess home and family variables. These methods, however useful for hypothesis generation and small-scale hypothesis testing, are too expensive, time-consuming, and unstandardized to be feasibly employed in program development and evaluation. Of necessity, most studies of this type are based on small samples of convenience, often drawn from programs serving low-income or minority families such as Head Start.

This body of research has identified various aspects of mother-child interaction, language style, maternal teaching behaviors, and parental beliefs and expectations as potential correlates of educational success. Some attempts have been made to develop instruments to measure these kinds of variables in observational and interview studies. However, as Scott-Jones (1984) concludes:

> Because of the complexity and variety of family interactional processes, difficulties occur in isolating the effects of specific variables (Hess, 1981). In many studies, the level of evidence is not such that competing hypotheses are eliminated. Strong cause-effect statements therefore are not possible. Some variables, however, have been identified frequently as correlates of cognitive development and achievement, although these may vary according to the child's age, nature of the task,

and socioeconomic status of the family. Much more research is needed on family processes correlated with achievement in various socioeconomic and racial groups, at various age levels, and for various tasks that children must master. (p. 292)

Our objective is to contribute to the development of programs that will improve the ultimate educational attainment of pre-kindergarten Hawaiian children. Although genetic, biological, and socio-economic factors may be correlated with educational-performance levels, such variables are generally beyond the influence of people who design educational programs. We are attempting to develop valid and reliable measures of those tractable features of the home environment of Hawaiian families that are significantly correlated with the academic success of young children.

Contemporary Hawaiian[1] families, like American families generally, are changing to meet the demands of current economic and social forces such as increased maternal employment and urbanization. Hawaiian families respond to these forces of social change in the context of their own unique historical-cultural values, patterns of family roles, their status as an ethnic minority of indigenous people, a renaissance of pride in Hawaiian language, history, and culture, the re-emergence of Hawaiians as a political force, and the changing perception of Hawaiianness by the rest of the ethnically-mixed population of the State of Hawaii.

In another line of study (Plett & Heath, 1987), we have compiled basic demographic information about young (under the age of five) Hawaiian children and their families. This information provides an empirical foundation for understanding contemporary families of Hawaiian children. Comparing ethnic-

[1]Defined here as ethnic Polynesians, descendants of people living in the Hawaiian Islands prior to 1778, the date of the beginning of contact with the West. The term includes all those who self identify as either Hawaiian or part-Hawaiian.

Hawaiians to non-Hawaiians living in this State we find that:

1. Most Hawaiians marry non-Hawaiians. About 30% of Hawaiian children have parents who are both Hawaiians.
2. Most Hawaiian children live in an urban environment.
3. Hawaiians divorce less often than non-Hawaiians.
4. Hawaiian women marry younger and begin having children earlier than non-Hawaiians.
5. The Hawaiian population is <u>younger</u> than the general State population.
6. Hawaiian children live in families (and households) that are about 40% larger than non-Hawaiian families.
7. About 75% of Hawaiian children live in married-couple families (the figure is 86% for non-Hawaiians).
8. Hawaiian families are poorer than non-Hawaiian families (15% of Hawaiian families are below the poverty level while 9% of non-Hawaiian families are).
9. Twenty percent of Hawaiians receive some post-secondary education compared to 40% of non-Hawaiians in the State.
10. Hawaiian children score significantly lower on educational achievement tests than their non-Hawaiian counterparts.
11. The <u>infant</u> mortality rate is 25% <u>higher</u> for Hawaiians than non-Hawaiians.
12. The <u>fetal</u> mortality rate is 30% <u>lower</u> for Hawaiians than non-Hawaiians.
13. A Hawaiian child is 53% more likely to be a confirmed victim of child abuse than a non-Hawaiian child.

In another study (Heath & Plett, 1986) a multi-variable quantitative model was developed to identify those neighborhoods with the largest number of Hawaiian children with the greatest need for early education services. Most pre-kindergarten Hawaiian children with special needs are concentrated in fewer than a dozen neighborhoods. A series of research summaries (Heath, 1987; Tibbetts & Heath, 1987) has compiled evidence suggesting that the dominant educational problem in the State, especially for ethnic-Hawaiian children, is low functional competence in the English language.

Thus we have a reasonably sound foundation of demographic-social information about young Hawaiian children and their families. We know in which communities the largest number of Hawaiian children of greatest need are to be found. Further, we have a clear indication of the priority educational need of our target population. The literature provides us clues about the processes in the home that may be of educational advantage to these children, and we have the benefit of the previous work of others in their attempts to construct useful measurement devices. To develop effective programs we agree with Scott-Jones (1984) that:

> Multidisciplinary studies are needed, with groups of researchers assessing different aspects of family influence, using a variety of methods. Variables that are typically isolated and studied separately might show stronger relationships with intellectual attainment when studied jointly. . . .
>
> A greater base of knowledge from research may help educators and social policymakers to discover which features of their programs and interventions are effective. Although it may be argued that intervention efforts should wait until more and

clearer evidence is in, an alternative point of view is that research and intervention should continue concurrently. In this effort, the sometimes conflicting spirit of science and spirit of activism and change must be kept in balance. (pp. 294-295)

Successful preschool programs produce not only short-term, statistically significant effects on preschool and kindergarten test performance levels but also enduring, long-term changes that continue to contribute to the educational success of children. To develop such a program, we must first identify those variables in the home environment that are tractable to program influence. Once identified, we must be able to assess these variables with a practical, reliable, and predictively-valid instrument. It was our purpose to construct such an instrument.

II. EXISTING INSTRUMENTS

There exists a sizable literature on the socio-demographic characteristics, culture, and home environments of Hawaiian families (Gallimore, Boggs, & Jordan, 1974; Howard, 1974; Jordan, D'Amato, & Joesting, 1981; Linnekin, 1985; Pukui, Haertig, & Lee, 1972). This literature provides no empirical evidence showing these characteristics are related to the educational achievement of Hawaiian children. To help develop and evaluate programs, we needed a reliable and valid instrument for assessing the learning environment in the homes of Hawaiian preschool-age children that would employ a structured interview or questionnaire format and require no more than 45 minutes to administer.

We first collected and reviewed published instruments for assessing educationally relevant characteristics of home environments. In addition to a review of recent journal articles, three major indexes of published instruments were searched for appropriate instruments. These indexes were Tests and Measurements in Child Development: Handbook II (Johnson, 1976), Tests in Print, III (Mitchell, 1983), and The Ninth Mental Measurements Yearbook (Mitchell, 1985). From this search, seven instruments were identified that purport to measure educational characteristics of the home environment. They are: (a) the Cognitive Home Environment Score (CHES), developed by Norma Radin; (b) the Deprivation Index, developed by Martin Deutsch, Martin Whiteman, and Estelle Peisach; (c) the Henderson Environmental Learning Process Scale (HELPS), developed by Ronald W. Henderson; (d) the Home Observation for Measurement of the Environment (HOME), developed by Bettye M. Caldwell and Robert H. Bradley (a birth to age 3 version and an age 3 to 6 version); (e) the first published version of the HOME, the Inventory of Home Stimulation-I (STIM), developed by Bettye M.

Caldwell; (f) an adaptation of the HOME called the Home Screening Questionnaire (HSQ), developed by the John F. Kennedy Child Development Center; and (g) the Human or Material Environment Scale, developed by Jean Carew Watts, Itty Chan Barnetty, and Christine Halfar. These instruments were compared on administration mode, administration time, target age of children, reliability, validity, and norming samples. These features of the seven instruments are shown in Table 1.

We were able to obtain copies of the CHES, HOME, and HELPS. Since the HSQ is a subset of the HOME and the STIM is an early version of the HOME no effort was made to obtain copies of these instruments. Based on the information available in the reviews of the instruments, the Deprivation Index and the Human or Material Environment Scale appeared inappropriate for our purposes and copies of these instruments were not sought. The Deprivation Index focuses on deficits in the home environment, and three of the six variables measured were not tractable to educational intervention or were inappropriate for preschool-age children. These variables are poor housing, number of children under 18 years, and no kindergarten experience. The Human or Material Environment Scale relies entirely on observation for data collection, and thus was an administration mode not suited to our needs or resources.

The HOME (Caldwell & Bradley, 1984) has been widely used as a measure of the home learning environments of young children. However we recognized a number of drawbacks in using the HOME for our purposes. For example, administration requires a one-hour observation/interview in the home with the mother. For this instrument the child must be both present and awake. This mode of administration is costly. In addition, research conducted by Levin

Table 1 Characteristics of Published Home Observational Environment Instruments

Title	Cognitive Home Environment Scale[1]	Deprivation Index[1]	Henderson Environmental Learning Process Scale[1]	Home Observation for Measurement of the Environment[2,3]	Home Observation for Measurement of the Environment, ages 3-6[2,3]	Home Screening Questionnaire[2]	Human or Material Environment Scale[1]
Author (s)	Norma Radin	Martin Deutsch, Martin Whiteman, and Estelle Poisach	Ronald W. Henderson	Bettye M. Caldwell and Robert H. Bradley	Bettye M. Caldwell and Robert H. Bradley	John F. Kennedy Child Development Center	Jean Carew Watts, Itty Chan Barnetty, and Christine Halfar
Child's Age	Preschool & Kindergarten	6 - 12	Preschool & Elementary	0 - 3	3 - 6	0 - 3, 3 - 6	1 - 3
Purpose	Measure degree of cognitive stimulation in home	Assess environmental factors related to scholastic performance	Measure characteristics of home environment related to intellectual and scholastic performance	Describe types of stimulation in home environment that foster cognitive development	Sample aspects of social, emotional, and cognitive support available to child and related to behavioral development	Identify high-risk infants due to deleterious home environments	Analysis of naturally occurring experiences
Variable (s)	Educational materials in the home Grades expected Future expectations Educationally oriented activities Direct teaching	Environmental conditions: ·economic conditions ·parental motivation ·parental interaction ·activities with adults ·previous schooling	Home Learning Environment: ·aspiration level ·range of stimulation ·parental guidance/ direct teaching ·range of adult models (occupation/education) ·nature of reinforcement models	Emotional & verbal responsivity of mother Acceptance of child's behavior Organization of physical and temporal environment Provision of appropriate play materials Maternal involvement with child Opportunities for variety in stimulation	Stimulation through toys, games, and reading materials Language stimulation Physical environment: safe, clean, and conducive to development Pride, affection and warmth Stimulation of academic behavior Modeling and encouragement of social maturity Variety of stimulation Physical punishment	(Based on HOME) questions developed from items in HOME Toy inventory form HOME inventory	Child's behavior: ·activity ·type of experience ·task mode ·task level ·task purpose ·success Human environment: ·initiation ·person ·encouragement ·interaction ·compliance ·verbal Material environment: ·rewa ·restriction ·object quality and size
Administration Mode	Semi-structured Questionnaire (25 items)	Structured interview	Structured Interview Likert-type scale (55 items)	Observation/interview (45 items)	Observation/interview (55 items)	Parent-answered Questionnaire, Toy Checklist	Naturalistic observation
Time to administer			20 minutes	60 minutes	60 minutes	15 - 20 minutes	15 sec. obs/15 sec. recording per each 10 min protocol (? # of protocols)
Reliability	Inter-rater reliability=.91		Cronbach Alpha=.71	Internal consistency= .89 (total score) Test retest=.62-.77	Internal consistency=.93 (total score) Test-retest=.05-.70	"reliability low", age 0-1=.62, ages 1-3=.82	Rater agreement=.67-.95
Validity	"Significantly correlated" with PPVT, Binet, Piagetian tasks	Loaded on interactive factors & aspiration level correlated with SES	"Highly correlated" with SCAT & Boehm Test of Basic Concepts	Moderate correlations with SES Correlation with 36 mo. Binet = .72	Moderate relationship with 3 SES indices "A positive relationship" between total scores at age 3 and 5 and SRA Achievement Test scores between ages 6 and 10	Concurrent validity with HOME Inventory = .61	Able to differentiate between children developing above or below average at age 3
Normed on:	115 low income mothers	163 fifth graders, 127 first graders	Mothers of 1st graders: 66 lower class Mexican-Americans and 60 middle class Anglos	174 welfare and non-welfare mothers	117 families	Normed on low income but well educated group--blacks underrepresented	

[1]Indexed in Tests and Measurements in Child Development: Handbook II (Johnson, 1976)
[2]Indexed in The Ninth Mental Measurements Yearbook (Mitchell, 1985)
[3]First published as the Inventory of Home Stimulation (IHS)

and associates (Levin & Brenner, 1987; Levin, Brenner, & McClellan, 1987) led us to reject the notion that a single one-hour observation by a stranger is likely to provide either a representative or a reliable typification of a family's learning environment.

The meaning of many of the behaviors to be recorded on the HOME varies among cultures. For example, there is great cultural variability in the appropriateness of accepting praise of one's children or speaking highly of one's children with non-family members. People who find these inappropriate are unlikely to praise or caress a child in the presence of an interviewer. The HOME includes items such as:

30. Parent praises child's qualities twice during visit.
31. Parent caresses, kisses or cuddles child during visit.
32. Parent helps child demonstrate some achievement during visit (Caldwell & Bradley, 1984, p. 106).

These parent behaviors, in the presence of formal visitors to the home, might be considered in bad taste in many families. To assume that the observed absence of such demonstrations has the same meaning in different cultural groups is seriously misleading.

In the HOME, considerable weight is given to object counts. Using object counts as a measure of home learning environment implies two assumptions. One assumption is that the objects are actually <u>used</u> for educational activities. The other assumption is that educational activities do not occur (or are less likely to occur) in the absence of these particular objects in the home. In the use of the HOME, the observer is instructed to document the presence of objects:

2. Child has three or more puzzles.
8. At least 10 books are visible in the apartment.

10. Family subscribes to at least one magazine

(Caldwell & Bradley, 1984, p. 106).

In our view educational influence is not to be found in objects but rather in activities and experiences.

Another set of items in the HOME documents material aspects of the child's home:

21. Interior of apartment not dark or perceptually monotonous.

22. Neighborhood is esthetically pleasing.

24. Rooms are not overcrowded with furniture

(Caldwell & Bradley, 1984, p. 106).

These items, and those yielding object counts, appear to be more directly related to SES than to the learning environment in the home. Upon studying the results obtained in studies employing the HOME presented in Gottfried (1984), one might reasonably conclude that the HOME instrument is fundamentally a surrogate measure of SES. Though SES is clearly correlated with educational achievement, as developers of educational (rather than economic) programs, we are not likely to encourage parents to buy objects, change neighborhoods, or repair structural building defects as a means of enhancing their child's educational achievement.

The authors of the CHES (Radin & Epstein, 1975), compare this instrument with the HOME (when it was called STIM).

> Both the CHES and the STIM ask specific questions about maternal behavior. . . . Further, the CHES and STIM are based on similar assumptions concerning conditions which foster the cognitive development of the young child. . . . The CHES differs from the STIM however, in that the STIM includes scores on observed behavior which the interviewer must be trained to collect. The CHES is administered entirely as a

questionnaire and requires nothing of the person posing the questions except interviewing skills. (p. 2)

The CHES interview uses open-ended questions. The respondents' answers to questions are content analyzed and assigned point values following the interview. Administration costs and reliability problems associated with interviewer bias, variations in interviewer skills, and difficulties associated with content analysis as well as the partial reliance on object counts led us to reject the CHES for our needs.

The HELPS was developed:

> in an attempt to develop procedures that would be more practical [for use with large samples], and that might have the potential for discriminating environmental differences and similarities between and within socioeconomic and ethnic groups. The results of this investigation indicated that a questionnaire instrument could be devised that would circumvent the problems associated with the administration and scoring of focused interviews, and at the same time identify environmental process variables related to school achievement. (Henderson, Bergan & Hurt, 1972, pp. 193-194).

Many of the questions in the HELPS are the same as, or quite similar to, those presented in the CHES, the primary difference being the use of Likert-type scales for recording the responses. The questionnaire mode of administration is more suited to our need to gather data on a large number of families. There are a few items that rely on the presence of "educational" objects, and a few that are culturally inappropriate for use with Hawaiian families. However, the major drawback of the instrument is that many of its questions are about family status variables and not about the child's experiences.

Although our review of existing instruments failed to discover a device that would serve our purposes of program development and formative evaluation, this review was of considerable value to us. It seems likely that, had others not already explored the use of object counts, unstructured interviews, brief observations of interactions, and the material characteristics of homes, we would have been drawn in those directions ourselves. By studying the instruments that have been developed in those pursuits and the results they have produced, we were able to identify more adequately the domains of content and assessment modalities needed in our own work.

III. METHODS

A. An interdisciplinary team

The Pre-Kindergarten Education Program of the Center for Development of Early Education at Kamehameha Schools/Bernice Pauahi Bishop Estate has available to it a multidisciplinary staff of researchers and program developers. As it became apparent that the program needed an instrument to assess variables in the home environment that are correlated with school performance, a five-member team from this staff was formed. This instrument development team included: (a) an educational anthropologist and; (b) a former teacher/home visitor; both of whom conducted parent-interviews and observed activities in homes; (c) a social-psychologist/methodologist, who focussed on the psychometric aspects of instrument development; (d) a researcher with social-work background who managed data collection and analysis; and, (e) on a consultant basis, an educational psychologist who specialized in multidimensional scaling. All members of the team participated in defining domains of content, item writing, review of literature, and interpretation of results.

Though these varied disciplinary backgrounds brought different perspectives to each stage of the instrument-development process, it was the <u>interaction</u> of these perspectives rather than unique points of view that was most productive. For example, the content domains were derived from hours of discussion about the meaning of interviews and observations, the research literature, the characteristics of existing instruments, and the technical considerations required for a useful assessment device. Similarly, as items were written, pilot-tested, and rewritten, the group painstakingly argued over nuances of wording, the implications of pilot-test response patterns, and the cultural appropriateness of particular elements of content. Team

members contributed suggestions and offered insights across disciplinary boundaries. Whatever defects or strengths may be found in the instrument as it now exists, we are convinced that it is much better than it would have been without this synthesis of professional experience.

B. Home learning environment

From 1985 to 1987 several members of the team conducted research on the organization of teaching and learning activities within the homes of approximately 20 preschool-age Hawaiian children (Levin & Brenner, 1987; Levin, Brenner, & McClellan, 1987). One part of this work was an attempt to catalog the materials in the home environment that seemed to promote literacy and familiarity with number concepts. After sorting through children's possessions and discussing with parents what they acquire for their children and why, these members concluded that object counts are useful but only for limited purposes.

We were able to discover whether literacy and numeracy-associated objects were available in the home, the range and variety of these materials, and how they were acquired and stored. However, object counts are an inadequate device to assess children's experiences and familiarity with printed materials or other objects. In addition to collecting object inventories, we talked with and watched children and their families engage in teaching and learning activities. Putting together these observations and discussions of <u>activities</u> with the object inventories, we came to see that a count of the <u>objects</u> in the home does not very effectively reveal the meaning of the activities, or how often, when, and in what ways objects are used.

Our attempts to catalogue the printed materials in the home led us to reject simple numerical counts as accurate indicators of children's experience and familiarity with printed materials. Straightforward numerical

counts may overestimate or underestimate the frequency of teaching and learning activities in the home. Numerical counts of printed materials may overestimate literacy activities in the home; literacy objects may be status markers rather than frequently used items. Good examples are the handsomely bound but often unused sets of encyclopedias or literary classics found in many homes.

A second problem with an object count is the likelihood of underestimation or misinterpretation of literacy activities. Our interview data illustrated these problems. When conducting an inventory of one child's belongings, we were cautioned by her mother, "But she hardly looks at these books anymore. The ones she looks at are at her grandma's." If we had not inquired, we might have underestimated the number of literacy objects available to this child, and also mistakenly assumed the child's reading interest and ability to be much lower than they were. When children spend a good part of the day in the homes of relatives or family friends, a print count of the child's own home will misrepresent materials available to the child.

Object counts may also not catch the flow of books and other materials through the home. Books, along with other children's possessions, go through periodic parental purges. When families move, children's books, along with other household goods, may be put into storage. Also, some families make heavy use of the public library. While they may have only a small number of library books at any time, their children have access to perhaps hundreds of library books passing through the home in a year.

C. Domain definition

At the beginning of the 1986-87 school year, several team members interviewed approximately 60 parents at the preschool sites. One of the

open-ended questions asked what their children liked to do at home. We used the summary of the answers to this question as well as our in-home interviews and observations of Hawaiian preschool-age children to help define the content of our first-draft list of learning activities that preschool children might engage in at home.

Thus, when we began to identify the domains to be assessed, we rejected simple counts of objects on the physical characteristics of the home. We did include both the allocation of the child's time to activities we know to be common to most children, and also included the frequency of a variety of home learning experiences. These interviews and observation data also helped define the domain of parent opinions about children and led us to develop a section of the instrument which tapped the social context of typical activities within the home of preschool children.

To further identify the state-of-the-art in the assessment of home learning environments, one of the authors visited several major universities and a Regional Laboratory and interviewed professionals working in the field at two national conferences (AERA and NCME). These contacts served to bring us up-to-date on the current status of instrument-development efforts and on the reasoning underlying these efforts.

Our next effort was to integrate (a) findings from observations and interviews in homes, (b) findings from parent interviews at preschool sites, (c) reviews of the research literature on the relationships between home environment and school achievement, (d) reviews of existing instruments, and (e) interviews with other professionals working in the field.

The team first identified five domains of content to be included in a draft instrument. Next, the team had a series of meetings to explore various points of view on the meaning of the five domains and the types of

assessment modalities that would be appropriate to each. The outcome of these meetings was the following definition of content domains and assessment modalities:

1. **How the child's time was allocated in the home among major activities:** a standard pair-comparison scaling technique would be used to assess how the child's time was distributed among a dozen or so major cognitive-related activities (excluding such universals as sleeping, eating, bathing, and so forth).
2. **Parents' preferences for how the child's time was allocated in the home:** pair-comparison scaling technique would be used to assess the parents' preference for the child's time allocation among these activities.
3. **The social context of the child's activities in the home:** contingency (or branching) questions would be employed to assess the social context of three education achievement-related activities. For example, "Does your child look at books, newspapers, or magazines at home?" "If so, who does your child do this with?"
4. **The frequency of a variety of learning experiences occurring in the home:** a frequency rating scale would be employed to assess the relative frequency of a variety of learning activities (playing cards, telling jokes, using workbooks, etc.).
5. **Parents' attitudes and beliefs about children's cognitive development and parents' roles in that development:** a Likert-style (four option) response mode would be used to assess parental attitudes.

D. **Pilot and field-testing**

At the outset of our instrument development process we made several decisions about the strategy we would use:

1. We would not attempt to name a set of scales and then write items to match these labels. Rather we would identify, based on the literature and previously published instruments, a limited number of broadly defined content domains and then, based on professional review, pilot testing, statistical analysis, revision, and re-pilot testing, identify scales that emerged empirically.
2. We would then validate these scales by studying their correlation with three types of educational achievement test scores: verbal, quantitative, and psycho-motor. Items or scales that did not correlate with achievement would be revised or discarded.
3. These cycles of writing, pilot testing, and revision would continue until a set of scales with demonstrated validity and reliability emerged from the data. Only then would we attempt to characterize the scales with titles.
4. The domains of content would <u>not</u> include object counts, physical attributes of the home, or status indicators.
5. The domains would focus on behavior, experiences, and beliefs in the family that we had some reason to predict are related to the school performance of the child and that were, at least conceivably, subject to program influence.
6. The instrument would not employ the idiosyncratic observations of a data collector or the subjective interpretation of responses to open-ended questions.

A first-draft version of an instrument (Home Learning Environment Profile) was prepared and circulated to 24 colleagues at the Center for Development of Early Education. Each reviewer was asked to comment on the instrument as a whole, to suggest changes in the questions and the directions, to point out omissions and to propose deletions. The 24 co-workers included psychologists (child, clinical, educational, community, and psychometric), anthropologists, a social worker, a demographer, teachers, and other practitioners. About half of this group responded with written comments and suggestions. Others preferred to offer informal suggestions in personal conversations. Many useful suggestions and comments were elicited.

Based on a compilation of these reactions, and following a series of meetings to interpret and implement them, a second-draft Profile was constructed. New instructions were written, many items were revised or deleted, and a new format was devised.

This second draft was then administered in a one-to-one interview mode to seven mothers of preschool-age children. These respondents not only were asked to respond to the questions but also were encouraged to comment on the readability of questions, the clarity of the directions, and any other sources of confusion or ambiguity. This pilot testing was completed in January 1987. Responses and comments from the pilot test formed the basis of an extensive revision that led to a third draft instrument. This version became the field-test edition of the Profile.

In April 1987, the field-test version was administered to the parents of 83 children enrolled in Kamehameha Schools' preschools. Over 90 percent of the children were of part-Hawaiian ethnicity. As in the pilot test, the instrument was administered in a one-to-one interview mode so that respondents' comments and suggestions for revision could be elicited

comfortably.

A considerable amount of demographic and test data was available on the 83 children and their families (see Table 2). Responses to the Profile and these other data were entered into a common data bank. The test data include Fall and Spring scores for the preschoolers on the Peabody Picture Vocabulary Test-Revised, Form L, (Dunn & Dunn, 1981), and the Circus (Learning Testing Service, 1976) tests of (a) Language Usage; (b) Language Understanding; (c) General Information; (d) Quantitative Concepts, and (e) Psycho-Motor Coordination. These scores were transformed into standardized variables (T scores) and combined to yield three highly stable educational achievement variables: Verbal, Quantitative, and Psycho-Motor. These served as dependent variables in subsequent analyses. Tables 3,4, 5 and 6 show the correlation of each item on the Profile, and the rank order of that correlation, with each of the three dependent (achievement) variables.

E. Item and cluster analyses[2]

An extensive series of item analyses and reliability computations were performed in an iterative fashion. That is, each item's p value and discrimination index was calculated as well as its correlation with the dependent variables. A total score for each child on each scale was computed. Weak items were eliminated. This process was then repeated until convergence on the subset of items that produced the most reliable total score with the greatest predictive validity was obtained. As item patterns (intercorrelations) began to appear, subsets of items were assigned scale

[2]Wendie Yumori was instrumental in designing and conducting the cluster analyses reported here. Further, she took a major role in the interpretation of the results of these analyses.

Table 2 Demographic Characteristics of Field-Test Sample (N=83)

	N	%
Child's gender		
Female	42	50.6
Male	41	49.4
Child's ethnicity		
Hawaiian/Part-Hawaiian	77	92.8
White	3	3.6
Other	3	3.6
Legal custody of child		
Both parents	61	73.5
Mother only	18	21.7
Father only	2	2.4
Other	2	2.4
Parents' marital status		
Single	18	21.7
Married	58	69.9
Divorced	3	3.6
Separated	3	3.6
Widowed	1	1.2
Mother's or mother substitute's employment status		
Full-time	19	22.9
Part-time	13	15.7
Temporary/Part-time	2	2.4
Unemployed[1]	46	55.4
Retired	2	2.4
No mother or substitute in home	1	1.2
Child's age		
Average months	58.9	
Parents' or parent substitutes' education (average years)		
Mother	12.3	
Father	12.7	

[1]Includes 45 women who described their occupation as "housewife"

labels. These subsets and the labels were submitted to a panel of nine colleagues. This panel was asked to independently assign items to scale labels and to suggest any scales (labels) that might have been overlooked (no other scales were suggested). This resulted in a set of scales, reliability coefficients, validity coefficients, item statistics (p and discrimination), and inter-scale correlations. Visual plots were used to identify outliers and set cutting levels for item inclusion.

Cluster analysis methods were also employed to construct scales. Cluster analysis is a general term for those methods that attempt to group items together on the basis of similarity. Clustering methods are generally descriptive in nature; they have value because of their simplicity and lack of assumptions. They can be especially useful in analyzing the items in an ordered category instrument as they provide information on the probable dimensionality of the instrument and graphically isolate items that do not belong (Dunn-Rankin, 1983). The purpose of cluster analysis in this case was to group relatively homogeneous items, or items that have some commonality. These scales would then be related to achievement.

In cluster analysis, the concepts of distance and similarity are especially important, since items are grouped on the basis of their "nearness". Just as there are many methods for calculating distances between items, there are many methods for combining items into clusters. A commonly used method is called agglomerative hierarchical cluster analysis.

The first step of hierarchical clustering is to combine two of the items into a single cluster. At the second step, either a third item is added to the cluster already containing two items, or two additional items are merged into a new cluster. At every step, either individual items are added to clusters or already existing clusters are combined. Once a cluster is

formed, it cannot be split--it can only be combined with other clusters. The graphic representation of this clustering process is termed an icicle plot. One of the five icicle plots for the 60 original field-tested items in the parent-opinion section of the instrument is given as an example in Figure 1. The merging of items into clusters is indicated by the configuration of the icicles in the plot.

Five different agglomerative hierarchical clustering methods were employed: Ward's Method, the Centroid Method, single-linkage, complete-linkage, and average-linkage-between-groups. In Ward's Method, the two clusters that merge at each step are those that result in the smallest increase in the overall sum of the squared within-cluster distances. The Centroid Method calculates the distance between two clusters as the distance between their means for all of the variables.

Of the five clustering methods used, the average-linkage-between-groups method appeared to yield the clusters which were most intuitively appealing. This method differs from the single-linkage method, in which the distance between two clusters is taken to be the distance between their two closest points, or the complete-linkage method, in which the distance between two clusters is calculated as the distance between their two furthest points. In the average-linkage-between- groups method, if items 1 and 2 form cluster A and items 3,4, and 5 form cluster B, the distance between clusters A and B is taken to be the average of the distances between the following pairs of cases: (1,3) (1,4) (1,5) (2,3) (2,4) (2,5). This method uses information about all pairs of distances, not just the nearest or the furthest. For further information on each of these clustering methods, see the SPSS-X Advanced Statistics Guide, pp. 180-181 (Norusis, 1985).

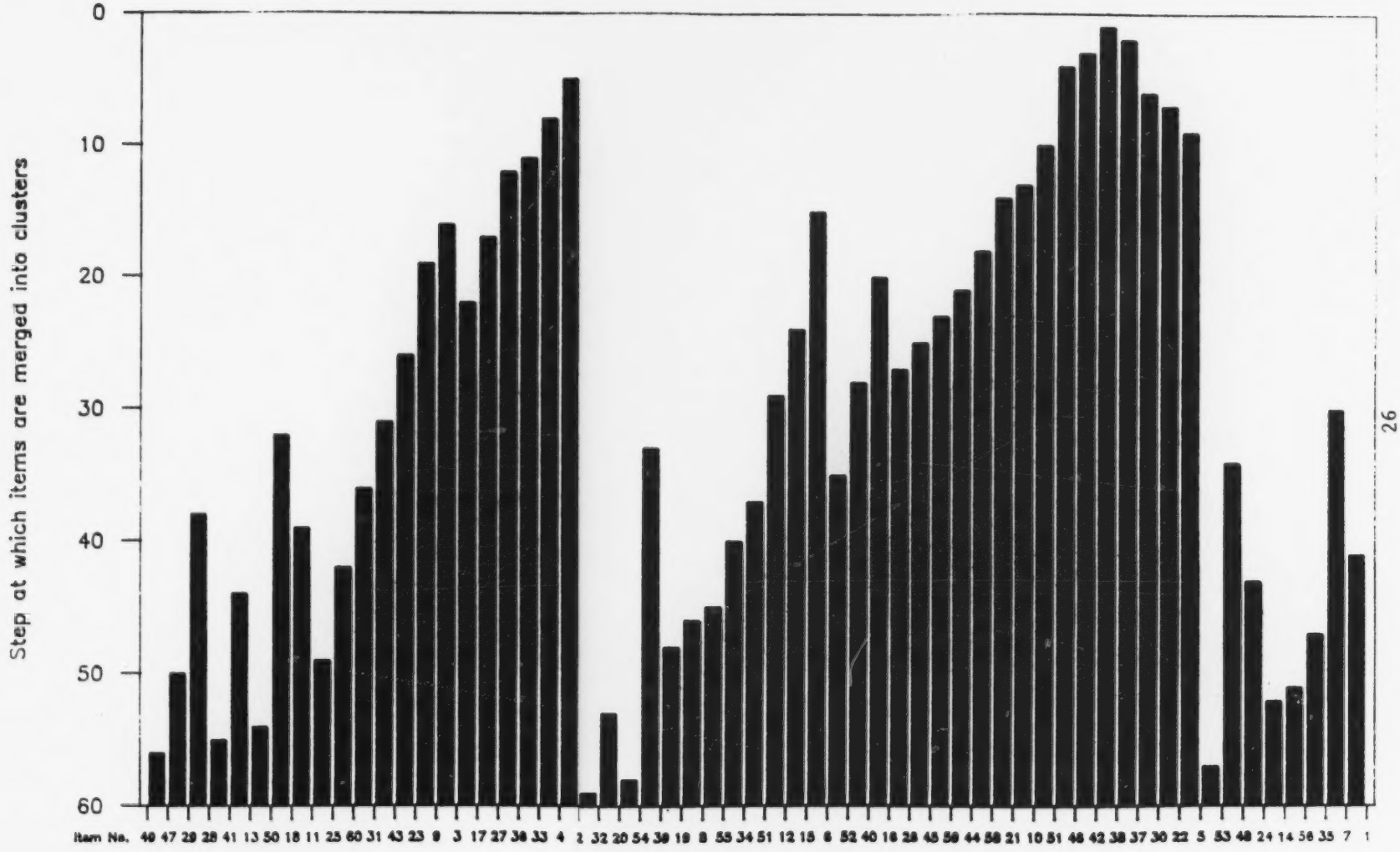


Figure 1. Example of plot of linkages between the 60 opinion items (taken from printout for average linkage between group method).

The icicle plots were interpreted in light of the content, or meaning, of the individual items. Clusters of items that yielded intuitively satisfying scales were identified. These scales (clusters) were then subjected to item-elimination procedures to maximize reliability (internal consistency) and validity (scale-criteria correlation). The surviving items formed the final scales.

Thus, two traditions of instrument-development statistical analyses were employed independently; conventional item analysis (to optimize reliability and validity), and cluster analysis. The results of these analyses were studied by the team and the final selection of items, assignment of items to scales, and the labelling of scales were completed.

Home Learning Experiences Scale

The field-test version of the Home Learning Experiences section of the Profile contained 33 items. These items were subjected to the cluster analyses and item analyses described. The results of the five clustering methods were studied. All five methods of clustering items except one (Ward's Method), produced a single main cluster. The item analyses identified eight items with item-total correlations of less than .60 and with non-significant correlations with the criterion (achievement test) variables. These eight items were also among those with the weakest linkages to the clusters produced. These eight items were dropped from the Home Learning Experiences scale and scale statistics were then recalculated with the remaining 25 items. The item correlations of the surviving items with the three achievement test score variables and rank order of these correlations are shown in Table 3. Scale total score correlations with other Profile scales and with the criteria variables are shown in Table 9. The

scale reliability (alpha) and the distribution of scale scores are shown in Table 10.

Attitude Scales

The field-test version of the Opinion section contained 60 items. Two independent approaches were taken in deriving scales from these items. Both cluster analysis and conventional item analysis approaches were used to derive preliminary scales. The results of these two approaches were then integrated to yield the final attitude scales.

The 60 items were assigned to clusters using each of the five methods of cluster analysis. Each cluster analysis method produced from three to five clusters. Some items, within each clustering method, were not assigned to any of the clusters defined by that method. Then, based upon the similarities of item assignments to clusters by the five methods, a composite set of four clusters, and corresponding item assignments (scales), was derived. Information from conventional item analysis procedures (item-total and item-criterion correlations), was then used to refine each of the scales to maximize their reliability and validity by deleting less effective items. Thus, the results of five cluster analysis procedures were integrated to derive four scales that included 38 of the original 60 field-tested items.

Independent of the cluster analysis, conventional item analysis/test development procedures were undertaken. The 60 field-test items were reviewed and eight potential scales were identified on the basis of the content. The list of items and descriptions of these eight scales were submitted to a panel of nine colleagues. Each member of this panel was asked to assign items to the eight a priori scales and to identify any other constructs implicit in the item content. They suggested no additional scales. This item assignment to scales provided the basis for preliminary

total scores used in conventional item analysis. As expected, the preliminary scoring schemes yielded lengthy scales with relatively low internal consistency and total score-criterion validity. Item-total correlations were plotted against item-criterion correlations in a bivariate distribution for each of the eight scales. These plots were then studied to select optimal items for each of the eight scales in a second round of scale development. This procedure was repeated, up to five times for some scales, until the scales had the highest possible reliability and validity.

Scales derived via the cluster analysis and item analysis methods were then reviewed and compared for similarity in content. Scales with poor reliability or validity and scales which were redundant or subsets of other scales were dropped. Based on this review, four attitude scales were retained, two derived from the cluster analysis approach (Parental Expectations and Educational Engagement) and two derived via the item analysis approach (Child Autonomy and Parental Responsibility for Teaching). These four scales included 43 of the original 60 opinion items.

The individual item correlations with the three achievement test score variables and rank order of these correlations for the 43 opinion items used in the final scales are shown in Table 4. Scale correlations with other Profile scales and with the criteria variables are shown in Table 9. The scale reliabilities and the distributions of scale scores are shown in Table 11.

Child Time Allocation Scales

There are two child time allocation scales, one for Reported Child Time Allocation and the other for Preferred Child Time Allocation. Each scale identifies child's relative use of time among ten activities. The procedures used in developing the scale scores are the same for both scales.

In deriving Reported Child Time Allocation scale scores, activity scores

were first calculated for each of the ten activities presented. The score for each activity is equal to the number of times that activity was chosen in the pair comparisons among all ten activities. Next, correlations between activity scores and educational achievement variables were calculated. Activity scores were then weighted by plus or minus one depending on the direction of the activity's correlation with the criteria. Weighted activity scores were summed for each child and this sum became the scale score. The same process was repeated to compute Preferred Child Time Allocation scale scores. Reasoning that the negatively weighted activities had already impacted on the positively weighted activities by reducing the number of times they were chosen, we tested a modified scoring system in which the scale score was equal to the sum of the positively weighted activity scores. This simplified scoring scheme resulted in no loss of predictive power and consequently replaces the sum of the ten weighted activity scores as the scale score. Kendall's coefficient of concordance (W), applied to ranks among the ten activities, was used as an index of reliability for these scales.

The ranks of time allocation activities by frequency reported or preferred, the correlation of individual activities with the three achievement test score variables and the ranks of these correlations are shown in Tables 5 and 6. Scale correlations with other Profile scales and with the criteria variables are shown in Table 9. The scale reliabilities and the distributions of scale scores are shown in Tables 12 and 13.

Social Context

Data were collected on the social context of three types of achievement-related activities. These activities were the following: (a) looking at books, newspapers, or magazines; (b) drawing, coloring, or writing; and (c)

watching TV or video cassettes at home. If respondents indicated that their child participated in these activities, they were asked if the child was more likely to do so alone, with preschool-age children, with school-age children, or with an adult. Single-classification analyses of variance (ANOVA's) were used to examine differences in achievement test scores for children who fell into each of the groups listed above. Results of the ANOVAs revealed no significant effect for group membership. F-ratios obtained ranged from .04 to 2.71 (the F probability ranged from .07 to .96). The lack of significance may have been due to the way the questions were presented or to restriction of range in our field-test population. This section of the field-test instrument was not used in further scale development and was not included in the final instrument.

Table 3 Correlation of Frequency of Home Learning Experiences with Types of Achievement Test

	Type of Test					
	Verbal		Quantitative		Psycho-Motor	
Home Learning Experience	Rank	r	Rank	r	Rank	r
Tell jokes or riddles to your child?	1	.33	1	.34	2	.17
Play ball with your child?	2	.30	2	.31	1	.19
Talk with your child about the colors of clothes while dressing?	3	.30	5	.23	3	.15
Tell stories to your child?	4	.29	7	.21	12	.09
Point out the shapes of things such as circles, triangles, and squares?	5	.27	9	.20	10	.09
Dance with your child or in your child's presence?	6	.27	4	.24	15	.08
Read or look at books, magazines, or newspapers with your child?	7	.27	6	.21	4	.12
Count things out loud for your child?	8	.26	10	.20	9	.10
Say or sing the alphabet with your child?	9	.25	11	.19	5	.12
Draw or paint in your child's presence?	10	.25	16	.16	25	-.02
Use workbooks, flashcards, or similar materials with your child?	11	.24	8	.21	16	.08
Talk with your child about the colors of traffic lights?	12	.23	17	.16	8	.11
Sing with your child or in your child's presence?	13	.23	13	.18	13	.08

Table 3 Correlation of Frequency of Home Learning Experiences with Types of Achievement Test (continued)

	Type of Test					
	Verbal		Quantitative		Psycho-Motor	
Home Learning Experience	Rank	r	Rank	r	Rank	r
Do home repairs or remodeling in your child's presence?	14	.22	21	.14	14	.08
Play board games or cards in your child's presence?	15	.22	20	.14	22	.01
Read labels to your child such as the labels on food packages or clothes?	16	.21	18	.16	24	-.01
Explain the meaning of words to your child?	17	.20	15	.17	11	.09
Explain signs or trademarks for your child?	18	.19	3	.25	17	.07
Do homework in your child's presence?	19	.18	14	.18	7	.11
Talk with your child about how family members are related to each other?	20	.17	24	.11	18	.06
Write letters, postcards, or messages in your child's presence?	21	.15	19	.15	21	.02
Give your child religious training?	22	.15	23	.12	19	.05
Read words from the TV screen to your child?	23	.14	12	.18	6	.12
Talk with your child about the numbers when changing TV stations or looking at the clock?	24	.10	25	.09	20	.05
Play school with your child?	25	.09	22	.13	23	.01

Table 4 Correlation of Opinion Items with Achievement Test Scores

Opinion	Type of Test: Verbal Rank	Verbal r	Quantitative Rank	Quantitative r	Psycho-Motor Rank	Psycho-Motor r
Young children (age 3-4) usually don't learn from their mistakes	1	.31	3	.18	4	.20
Parents should not allow the family life to be centered around the children	2	.26	8	.15	2	.24
Children should learn mostly by asking questions	3	.26	1	.27	8	.14
Parents have little influence on what kind of adult their child will become	4	.25	2	.24	1	.26
It is very important for children to speak proper English even before they go to kindergarten	5	.24	5	.18	16	.08
Young children should be taught that life is not going to be easy	6	.23	6	.18	7	.16
Parents should not make their children unhappy	7	.21	10	.13	5	.20
Young children don't think logically	8	.15	16	.09	3	.21
Children should know how to write their first name before they go to kindergarten	9	.15	27	.01	35	(-.09)
Too much importance is placed on taking children to places like libraries, museums, and zoos.	10	.14	4	.18	6	.17
Children should be able to write the letters of the alphabet before they go to kindergarten	11	.14	12	.11	31	(-.07)

Table 4 Correlation of Opinion Items with Achievement Test Scores (continued)

Opinion	Type of Test: Verbal Rank	Verbal r	Quantitative Rank	Quantitative r	Psycho-Motor Rank	Psycho-Motor r
Children should learn mostly by observing	12	.14	19	.08	10	.13
Children's personalities are determined by how parents raise them	13	.13	7	.17	15	.09
Young children learn the names of common objects without being taught	14	.13	9	.14	12	.11
It is not very important to teach young children to obey	15	.13	15	.09	13	.11
Children should be able to say or sing the alphabet by the time they are 4 years old	16	.13	22	.05	33	(-.08)
By age 4 children should know how to recite numbers 1 to 10	17	.12	11	.12	9	.14
Young children should not bother their parents too much	18	.10	39	(-.11)	21	.03
It is the responsibility of parents to see that their children do well in school	19	.09	14	.09	14	.09
To do well in school, children need to be given educational toys	20	.08	28	.01	22	.02
You can't really teach young children creativity and originality	21	.07	13	.09	18	.06
Children should always respect adults	22	.03	26	.03	25	.00

Table 4 Correlation of Opinion Items with Achievement Test Scores (continued)

Opinion	Type of Test: Verbal Rank	Verbal r	Quantitative Rank	Quantitative r	Psycho-Motor Rank	Psycho-Motor r
The quality of my child's life will not depend on how well he/she does in school	23	.03	23	.04	19	.04
Children should do what they are told without explanation	24	.02	18	.08	24	.00
Some children just don't like school and you can't do anything about it	25	.01	21	.06	26	(-.01)
A four-year college education would help my child have a better adult life	26	(-.01)	38	(-.11)	27	(-.03)
The needs of the family are more important than the needs of any one child	27	.00	33	(-.02)	23	.01
Even young children (age 3-4) should use good manners	28	(-.01)	35	(-.02)	28	(-.03)
Most parents put too much pressure on their children	29	(-.02)	25	.03	30	(-.06)
Before they go to kindergarten, children should be taught to recognize common signs such as "Stop", "In/Out", and "Push/Pull"	30	(-.02)	30	(-.01)	36	(-.12)
When children watch too much TV, it's their parents' fault	31	(-.04)	32	(-.01)	32	(-.08)
Children should not be taught to read before they go to kindergarten	32	(-.04)	17	.09	17	.08
Too much importance is placed on sending young children to school	33	(-.08)	37	(-.11)	37	(-.13)

Table 4 Correlation of Opinion Items with Achievement Test Scores (continued)

	Type of Test					
	Verbal		Quantitative		Psycho-Motor	
Opinion	Rank	r	Rank	r	Rank	r
Children do not need to be able to recognize the letters of the alphabet before they go to kindergarten	34	(-.09)	31	(-.01)	11	.11
Young children (age 3-4) learn more from play than they do from schooling	35	(-.09)	36	(-.03)	42	(-.22)
It is sometimes good for children to question adult authority	36	(-.09)	20	.06	38	(-.14)
Most children need more time by themselves	37	(-.10)	29	.00	43	(-.28)
It is very important for young children to play "school"	38	(-.15)	40	(-.11)	41	(-.20)
It is very important for parents to show their children how to use a variety of tools such as screwdrivers, needles, and scissors	39	(-.15)	24	.04	20	.03
Early childhood (age 3-4) should be a time for fun and play rather than school and learning	40	(-.20)	34	(-.02)	29	(-.04)
It is important for parents to teach their children at home and not rely entirely on the schools	41	(-.21)	41	(-.13)	40	(-.17)
Parents should always set a good example for their children	42	(-.24)	43	(-.19)	39	(-.16)
Young children have to be taught to stand up for themselves	43	(-.26)	42	(-.15)	34	(-.08)

Table 5 Reported Child Time Allocation: Activities and Educational Performance

Activity	Rank by Reported Time Spent	Rank by Correlation with: Verbal Tests	Rank by Correlation with: Quantitative Concepts Test	Rank by Correlation with: Psycho-Motor Test
Play outside: run, play ball, swim, swing, or ride bike	1	3 (.14)	1 (.15)	8 (-.12)
Scribble, write, draw, color, paint or cut paper	2	1 (.20)	3 (.09)	1 (.26)*
Sing, dance, or listen to music	3	7 (-.02)	8 (-.07)	2 (.16)
Talk or chat with someone	4	2 (.14)	2 (.12)	3 (.11)
Play with toys: blocks, trucks, dolls, or cars	5	6 (-.01)	4 (.06)	9 (-.24)*
Watch TV or videotapes	6	5 .00	7 (-.03)	7 (-.08)
Look at books	7	4 (.00)	5 (.06)	4 (.07)
Wrestle, rough-house, or tumble indoors	8	9 (-.15)	9 (-.13)	10 (-.25)*
Play make-believe	9	10 (-.18)	10 (-.15)	6 (.05)
Help around the house	10	8 (-.05)	6 (.02)	5 (.07)

*Correlation significant at the .05 level [.209 to .269]
**Correlation significant at the .01 level [.270+]

Table 6 Preferred Child Time Allocation: Activities and Educational Performance

Activity	Rank by Reported Time Spent	Rank by Correlation with: Verbal Tests	Rank by Correlation with: Quantitative Concepts Test	Rank by Correlation with: Psycho-Motor Test
Scribble, write, draw, color, paint or cut paper	1	6 (.00)	5 (.01)	5 (-.06)
Sing, dance, or listen to music	2	7 (-.01)	7 (-.12)	2 (.13)
Talk or chat with someone	3	2 (.23)*	1 (.30)**	3 (.12)
Look at books	4	9 (-.32)**	9 (-.19)*	10 (-.15)
Play outside: run, play ball, swim, swing, or ride bike	5	1 (.32)**	2 (.20)	4 (.03)
Help around the house or yard	6	8 (-.22)*	8 (-.12)	8 (-.12)
Play with toys: blocks, trucks, dolls, or cars	7	5 (.02)	6 (-.06)	7 (-.08)
Play make-believe	8	4 (.05)	3 (.07)	1 (.18)
Watch TV or videotapes	9	10 (-.34)**	10 (-.25)*	9 (-.13)
Wrestle, rough-house, or tumble indoors	10	3 (.15)	4 (.04)	6 (-.07)

*Correlation significant at the .05 level [.209 to .269]
**Correlation significant at the .01 level [.270+]

IV. RESULTS

The series of pilot and field tests and the various analyses of the data they generated resulted in seven scales. Each of these scales assesses a different facet of the child's home learning environment. The scoring protocol for each scale is based on the correlation of items and combinations of items with educational achievement test performance. The child's score on each scale is expressed in a standardized (T) score form. Thus, it is possible to construct a profile for each student that displays the relative strengths and weaknesses in that child's home environment (see Figure 2). The seven scales are:

Home Learning Experiences: This scale consists of a list of 25 experiences common in most homes that were significantly related to the educational performance of preschool children. The scoring protocol is based on these correlations. Parents indicate on the Profile how frequently their children engage in each activity or observe another person in that activity.

Parental Responsibility for Teaching: Scores on this 20-item scale indicate how parents view their responsibility for teaching preschool children in the home. A high score indicates that the parent believes schooling is important, and that teaching young children language skills, numbers, and other academic skills at home is a responsibility of parents. A high score indicates that the respondent believes that parents can do much to determine how well their children do in subsequent schooling. High scorers do not believe that early childhood should be devoted to play or that early teaching in the home is harmful to children.

HOME LEARNING ENVIRONMENT PROFILE:

STUDENT REPORT

Name:

I.D. No.:

Site:

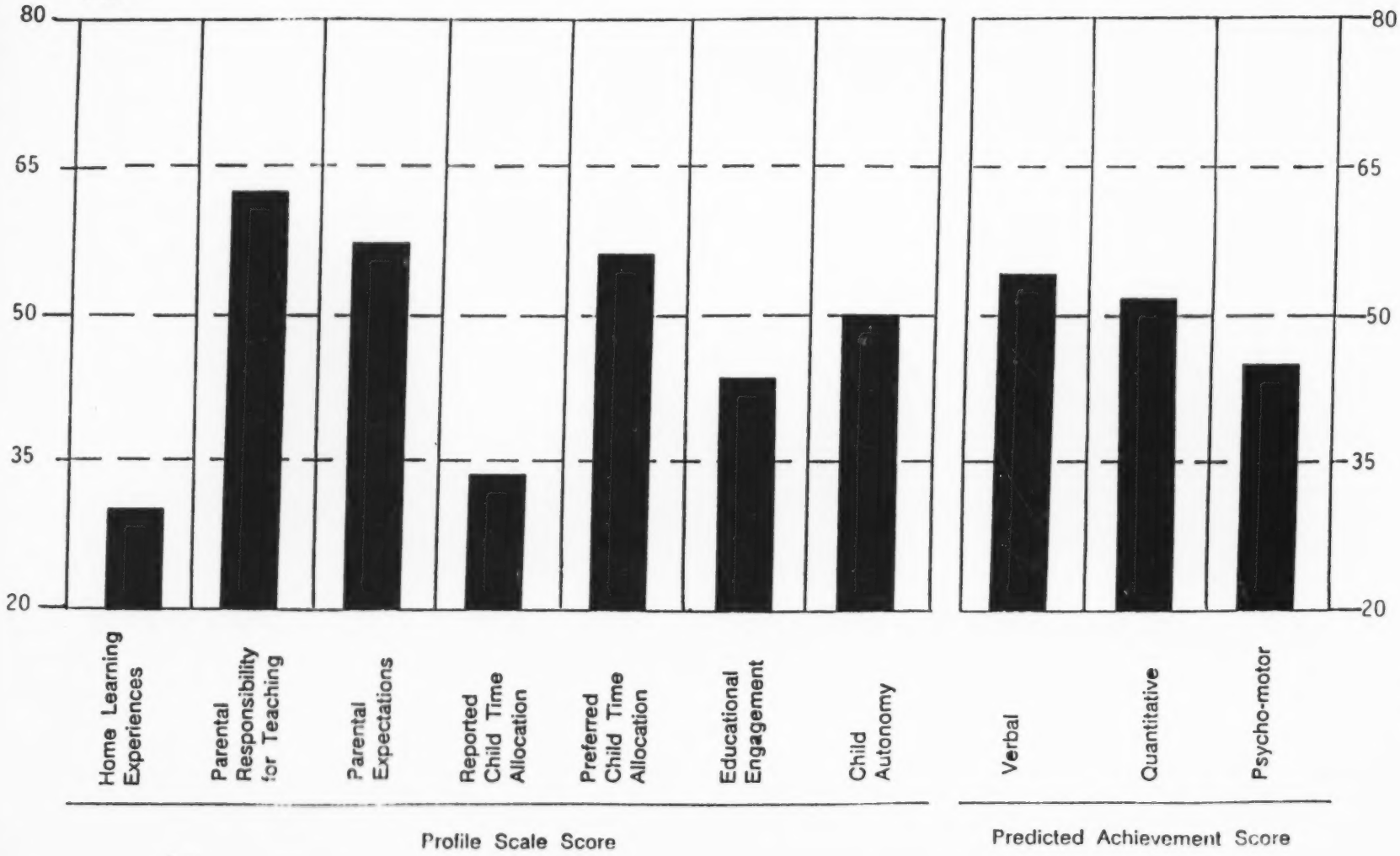


Figure 2. Sample Individual Profile

Parental Expectations: This 19-item scale reflects the parents' expectations for their preschool-age children's learning. Parents with high scores tend to believe that children should learn the alphabet, numbers, and colors before they enter kindergarten. They expect children to respect adults, use good English, and learn manners at an early age. They believe that education is important for their child and that children can demonstrate educational growth in the preschool years.

Educational Engagement: This 15-item scale is a measure of parental concern for educational activities during early childhood. A high score indicates that the parent has the opinion that the preschool years are a time for instruction, not just play. Low scores are associated with beliefs that young children are not highly rational, that direct instruction and pressure to learn are not good, and that parental influence during the preschool years has limited effect on their children's ultimate educational success.

Child Autonomy: This 8-item scale score reflects parental beliefs that young children learn independently, need time by themselves, and are responsible for their own learning. A high score indicates that the parent thinks children should question adult authority, that they learn more by observation than from instruction, and that the family should not be child-centered.

Reported Child Time Allocation: This scale is based on the relative allocation of the child's time among 10 common home activities. Relative time allocation among these activities is reported by the parent through a pair-comparison scaling technique. The scoring protocol is derived from the empirical correlation of each of the activities with preschool educational achievement test performance.

Preferred Child Time Allocation: This scale is based on the parents' preference for the child's allocation of time among the same 10 activities. The same pair-comparison response mode is employed to rank order these preferences. The scoring protocol is based on the correlation of these parent-preferences with children's performance on educational achievement tests.

The number of items and the reliability of each of the seven scales and each of the educational achievement test criteria are given in Table 7. The reliability estimates of the seven Profile scales are influenced by the limited variability of the population used in the instrument development process. This restriction of range, due to a selected and relatively homogeneous respondent group, can be expected to result in diminished reliability coefficients. Nevertheless, each of the seven scales is sufficiently reliable to produce significant correlations with the criterion variables and to make a significant contribution to the multiple correlation of combined scales with criteria.

In August 1987 the Profile was again administered, this time to the parents of 119 children accepted for Fall admittance to Kamehameha Schools' preschools. Over 90 percent of children were Hawaiian or part-Hawaiian. The average age of the children was 49.9 months. The instructions of the Profile were modified so that the instrument could be self-administered. The Spring and Summer means and standard deviations for the seven Profile scales are given in Table 14. Comparisons of the item means for the April and August samples appear in Tables 15-18.

Table 7 Reliability of Profile Scales and Educational Achievement Tests

	Number of Items	r_{tt}[1] Spring '87 (n=83)	r_{tt}[1] Summer '87 (n=119)[5]
PROFILE SCALES:			
Home Learning Experiences	25	.98	.86
Parental Responsibility for Teaching	20	.65	.54
Parental Expectations	19	.55	.42
Child Autonomy	8	.40	.45
Educational Engagement	15	.22	.15
Reported Child Time Allocation	10	.79	.35
Preferred Child Time Allocation	10	.89	.49
EDUCATIONAL ACHIEVEMENT TESTS[2]:			
Verbal[3]	NA	.82	
Quantitative[4]	80	.87	
Psycho-motor[4]	30	.90	

1. For the verbal achievement criterion, reliability estimates provided by the test publishers were converted to Fisher's Zs, averaged, and then converted back to an alpha distribution. Reliability coefficients reported for the Quantitative and Psycho-Motor scores are those provided by the test publisher. Reliability coefficients for Reported and Preferred Child Time Allocation are Kendall's Ws. All other reliability coefficients are Cronbach's alphas calculated by SPSS-X reliability procedures.

2. Achievement criterion scores were derived from combinations of pre and posttest achievement scores. For the Verbal criterion score, T-scores for PPVT-R, Language Usage, Language Understanding and General Knowledge pre and posttests were summed. The sum was then transformed into a T-score. For the Quantitative criterion score, T-scores for pre and posttests for Quantitative Concepts were summed and the sum was converted to a T-score. The same procedure was followed for the Psycho-Motor criterion score, using pre and posttest Psycho-Motor T-scores.

3. Number of items varies due to inclusion of PPVT-R (form L)

4. Since pre and posttest scores were combined, the number of items used to measure educational achievement is twice the number of items in these tests.

5. The Profile was administered to parents of children selected for Fall term admission to preschool in August 1987.

The multiple correlation coefficients (R) of the seven scales with each of the three achievement criteria are shown in Table 8. Two of the three Rs are significant at the .01 level, the other at the .05 level. These validity coefficients compare favorably with the criterion-validity coefficients reported for educational achievement and intelligence tests (the Profile correlates .59 with verbal achievement test scores). Cattell (1983) states "The level of prediction of school achievement (average over subjects) from the ordinary intelligence test is known from literally hundreds of research studies to be about +0.55" (p. 36). Criterion validity at these levels of measures of the home learning environment is very encouraging and perhaps somewhat surprising. The difficulties of testing the academic skills of preschool children and the psychometric problems often ascribed to the assessment of attitudes, beliefs, and parental reports of children's behavior were not encouraging considerations as we began this work. These validity coefficients suggest that such concerns have been unfounded.

The Pearson correlations (r) among the 10 variables, both dependent and independent, are given in Table 9. Brief study of this table will reveal that the patterns of predicting achievement test performance from the home environment vary considerably by type of cognitive activity. Some home life characteristics are more important influences on quantitative achievement while others are more clearly associated with verbal or psycho-motor test performance.

The frequency distribution, percentile distribution, reliability coefficient, and criterion correlations for each of the seven scales are reported in Tables 10 through 13. The correlation of individual scales is generally lower with psycho-motor test scores than with either verbal or quantitative-concept test scores. Since psycho-motor scores are expected to be more influenced by physical

maturation and less influenced by home and family environment, this correlational pattern is consistent with the construct validity of the Profile.

Table 8 Multiple Regression of the Seven Home Learning Environment Profile Scale Scores with Three Types of Educational Achievement Test Scores (April '87 sample)

Type of Achievement Test Score	R
Verbal	.59**
Quantitative	.45*
Psycho-Motor	.51**

**Significant at the .01 level
*Significant at the .05 level

Table 9 Correlations Among Profile Scales and Educational Test Scores (April '87)

	Parental Responsibility for Teaching	Parental Expectations	Child Autonomy	Educational Engagement	Reported Child Time Allocation	Preferred Child Time Allocation	Verbal	Quantitative	Psycho-motor
1. Home Learning Experiences	.26*	.22*	.15	.06	.24*	.07	.26*	.22*	.10
2. Parental Responsibility for Teaching		.76*	.50*	.61*	.13	.35*	.43*	.28*	.19*
3. Parental Expectations			.38*	.41*	.12	.32*	.33*	.20*	.14
4. Child Autonomy				.60*	.06	.22*	.40*	.21*	.47*
5. Educational Engagement					-.00	.22*	.33*	.23*	.37*
6. Reported Child Time Allocation						.14	.30*	.26*	.03
7. Preferred Child Time Allocation							.36*	.31*	.15
8. Verbal								.81*	.62*
9. Quantitative									.59*

*Significant at the .05 level

Table 10 Frequency Distribution and Summary Statistics: Home Learning Experiences Scale Scores (April '87)

T Score Range	Frequency	Percentile[1]
65-69	8	100.0
60-64	17	90.4
55-59	6	69.9
50-54	3	62.7
45-49	11	59.0
40-44	31	45.8
35-39	7	8.4

N-83

Number of items - 25
Alpha - .9830

Correlation with Educational Achievement Tests

Type of Test	r
Verbal	.26**
Quantitative	.22*
Psycho-motor	.10

**Significant at the .01 level
* Significant at the .05 level
[1]Percentile corresponding to upper interval limit

Table 11 Parent Opinions: Frequency Distributions and Summary Statistics (April '87)

T Score Range	Parental Responsibility for Teaching		Parental Expectations		Child Autonomy		Educational Engagement	
	Freq.	%ile[1]	Freq.	%ile	Freq.	%ile	Freq.	%ile
75-79	1	100.0	1	100.0				
70-74			2	98.8				
65-69	4	98.8	6	96.4		100.0	5	100.0
60-64	11	92.8	7	89.2	14	95.2	6	94.0
55-59	10	79.5	4	80.7	12	78.3	15	86.7
50-54	9	67.5	21	75.9	19	63.9	27	68.7
45-49	23	56.6	13	50.2	16	41.0	9	36.1
40-44	15	28.9	18	34.9	7	21.7	9	25.3
35-39	3	10.8	8	13.3	6	13.3	6	14.5
30-34	5	7.2	3	3.6	1	6.0	3	7.2
25-29	1	1.2			4	4.8	1	3.6
20-24							1	2.4
15-19							1	1.2
N=83								
Number of items =	20		19		8		15	
Alpha =	0.65		0.55		0.40		0.22	

Correlation with Tests of Educational Achievement Tests

Type of Test	r	r	r	r
Verbal	.43**	.33**	.40**	.33**
Quantitative	.28**	.20*	.21*	.23*
Psycho-motor	.19*	.14	.47**	.37**

**Significant at the .01 level
*Significant at the .05 level
[1]Percentile corresponding to upper interval limit

Table 12 Frequency Distributions and Summary Statistics: Reported Child Time-Allocation (RCTA) Scores (April '87)

T Score Range	Frequency	Percentile[1]
70-74	1	100.0
65-69	1	98.8
60-64	9	97.6
55-59	21	86.7
50-54	10	61.5
45-49	24	49.4
40-44	4	20.5
35-39	9	15.6
30-34	1	4.8
25-29	1	3.6
20-24	1	2.4
15-19		1.2
10-14	1	1.2

N-83

Number of items - 10
Kendall's W - 0.79

Correlation with Educational Achievement Tests

Type of Test	r
Verbal	.30**
Quantitative	.26**
Psycho-motor	.03

**Significant at the .01 level
[1]Percentile corresponding to upper interval limit

Table 13 Frequency Distributions and Summary Statistics: Preferred Child Time-Allocation (PCTA) Scores (April '87)

T Score Range	Frequency	Percentile[1]
65-69	9	100.0
60-64	3	89.2
55-59	16	85.5
50-54	19	66.3
45-49	7	43.4
40-44	19	34.9
35-39	4	12.0
30-34	5	7.2
25-29	1	.2

N=83

Number of items = 10
Kendall's W = .89

Correlation with Educational Achievement Tests	
Type of Test	r
Verbal	.36**
Quantitative	.31**
Psycho-motor	.15

**Significant at the .01 level
[1]Percentile corresponding to upper interval limit

Table 14 Comparison of Scale Scores for Spring and Summer 1987 Samples

Scale	April		August	
	Average	S.D.	Average	S.D.
Home Learning Experiences	55.5	24.1	81.6	8.7
Parental Responsibility for Teaching	49.4	7.2	47.4	5.8
Parental Expectations	39.2	5.7	39.2	5.2
Child Autonomy	22.0	3.9	22.1	3.7
Educational Engagement	39.1	4.5	37.8	4.3
Reported Child Time Allocation	23.4	3.2	24.0	3.6
Preferred Child Time Allocation	16.0	4.3	14.9	3.5

Table 15 Comparison of Home Learning Experiences Item Means: April and August 1987 Samples

Home Learning Experience Item	Item Means	
	April (n=83)	August (n=131)
Tell jokes or riddles to your child?	2.2	3.0
Play ball with your child?	2.1	3.4
Talk with your child about the colors of clothes while dressing?	2.1	3.4
Tell stories to your child?	2.2	3.5
Point out the shapes of things such as circles, triangles, and squares?	2.1	3.5
Dance with your child or in your child's presence?	2.2	3.5
Read or look at books, magazines, or newspapers with your child?	2.2	3.5
Count things out loud for your child?	2.1	3.7
Say or sing the alphabet with your child?	2.2	3.6
Draw or paint in your child's presence?	2.4	3.1
Use workbooks, flashcards, or similar materials with your child?	2.3	2.9
Talk with your child about the colors of traffic lights?	2.1	3.3
Sing with your child or in your child's presence?	2.1	3.7
Do home repairs or remodeling in your child's presence?	2.4	3.1
Play board games or cards in your child's presence?	2.4	3.2
Read labels to your child such as the labels on food packages or clothes?	2.2	3.0
Explain the meaning of words to your child?	2.3	3.5
Explain signs or trademarks for your child?	2.3	2.8

Table 15 Comparison of Home Learning Experiences Item Means: April and August 1987 Samples (continued)

Home Learning Experience Item	Item Means	
	April (n=83)	August (n=131)
Do homework in your child's presence?	2.3	3.0
Talk with your child about how family members are related to each other?	2.2	3.4
Write letters, postcards, or messages in your child's presence?	2.3	3.0
Give your child religious training?	2.2	3.3
Read words from the TV screen to your child?	2.1	3.1
Talk with your child about the numbers when changing TV stations or looking at the clock?	2.0	3.1
Play school with your child?	2.2	3.1

Table 16 Comparison of Opinion Item Means: April and August 1987

Opinion Item	Item Means	
	April (n=83)	August (n=119)
Young children (ages 3-4) usually don't learn from their mistakes	2.7	3.0
Parents should not allow the family life to be centered around the children	2.9	3.0
Children should learn mostly by asking questions	1.6	1.8
Parents have little influence on what kind of adult their child will become	3.5	3.3
It is very important for children to speak proper English even before they go to kindergarten	2.0	1.6
Young children should be taught that life is not going to be easy	1.9	2.1
Parents should not make their children unhappy	1.8	1.8
Young children don't think logically	2.9	3.1
Children should know how to write their first name before they go to kindergarten	2.1	1.6
Too much importance is placed on taking children to places like libraries, museums, and zoos	3.4	3.1
Children should be able to write the letters of the alphabet before they go to kindergarten	2.9	2.3
Children should learn mostly by observing	2.6	2.5
Children's personalities are determined by how parents raise them	1.6	1.6
Young children learn the names of common objects without being taught	2.6	2.8
it is not very important to teach young children to obey	3.7	3.4

Table 16 Comparison of Opinion Item Means: April and August 1987 (continued)

Opinion Item	Item Means	
	April (n=83)	August (n=119)
Children should be able to say or sing the alphabet by the time they are four years old	1.9	1.4
By age four children should know how to recite numbers 1 to 10	1.4	1.2
Young children should not bother their parents too much	3.7	3.8
It is the responsibility of parents to see that their children do well in school	1.2	1.2
To do well in school, children need to be given educational toys	1.3	2.1
You can't really teach young children creativity and originality	3.6	3.3
Children should always respect adults	1.3	1.3
The quality of my child's life will not depend on how well he/she does in school	3.6	3.1
Children should do what they are told without explanation	3.4	3.3
Some children just don't like school and you can't do anything about it	1.4	1.5
The needs of the family are more important than the needs of any one child	1.8	1.8
Even young children (ages 3-4) should use good manners	1.3	1.3
A four-year college education would help my child have a better adult life	1.9	1.6
Most parents put too much pressure on their children	3.0	2.8
Before they go to kindergarten, children should be taught to recognize common signs such as "Stop", "In/Out", and "Push/Pull"	1.7	1.6

Table 16 Comparison of Opinion Item Means: April and August 1987 (continued)

Opinion Item	Item Means	
	April (n=83)	August (n=119)
When children watch too much TV, it's their parents' fault	1.5	1.7
Children should not be taught to read before they go to kindergarten	1.4	1.5
Too much importance is placed on sending young children to school	1.9	1.9
Children do not need to be able to recognize the letters of the alphabet before they go to kindergarten	2.2	2.1
Young children (ages 3-4) learn more from play than they do from schooling	1.9	2.0
It is sometimes good for children to question adult authority	3.5	3.3
Most children need more time by themselves	2.1	1.8
It is very important for young children to play "school"	1.7	1.8
It is very important for parents to show their children how to use a variety of tools such as screwdrivers, needles, and scissors	3.3	3.1
Early childhood (ages 3-4) should be a time for fun and play rather than school and learning	2.2	1.8
It is important for parents to teach their children at home and not rely entirely on the schools	3.7	3.6
Parents should always set a good example for their children	3.9	3.9
Young children have to be taught to stand up for themselves	3.0	3.1

Table 17 **Comparison of Reported Child Time Allocation Means: April and August 1987**

Activity	Item Means	
	April (n=83)	August (n=128)
Play outside: run, play ball, swing, or ride bike	7.4	7.6
Scribble, write, draw, color, paint or cut paper	6.6	5.6
Sing, dance, or listen to music	5.0	4.8
Talk or chat with someone	4.9	4.4
Play with toys: blocks, trucks, dolls, or cars	4.4	6.3
Watch TV or videotapes	4.4	4.0
Look at books	4.2	2.5
Wrestle, rough-house, or tumble indoors	3.9	3.7
Play make-believe	2.5	2.3
Help around the house	1.7	3.2

Table 18 Comparison of Preferred Child Time Allocation Means: April and August 1987

Activity	Item Means	
	April (n=83)	August (n=128)
Scribble, write, draw, color, paint or cut paper	7.4	7.6
Sing, dance, or listen to music	6.4	5.4
Talk or chat with someone	6.3	4.5
Look at books	5.9	4.7
Play outside: run, play ball, swim, swing, or ride bike	5.9	6.5
Help around the house or yard	3.8	4.6
Play with toys: blocks, trucks, dolls, or cars	3.4	5.3
Play make-believe	2.9	2.2
Watch TV or videotapes	2.1	1.9
Wrestle, rough-house, or tumble indoors	1.0	1.6

V. DISCUSSION

Perhaps the most interesting outcome of this work is the finding that a rigorous assessment of home environment variables can be as predictive of the educational achievement of young children as individually-administered intelligence tests. There has been a long standing belief that intelligence tests somehow produce "hard" data while attitude scales and behavioral reports are "soft." Our findings show this belief to be unfounded in terms of both reliability and validity.

The Profile scales correlate differentially with tests of verbal, quantitative and psycho-motor skills. Thus the results do not support the notion that there is one best way that families can support the cognitive growth of children. Rather, this work illustrates that some of the features of individual family environments strongly support the development of some cognitive skills while contributing less strongly to the development of others.

The results suggest that reproducing traditional or formal features of a school environment in the home is not the most effective way of influencing the achievement level of a preschool child. Using workbooks or flashcards at home with preschoolers, for example, is less strongly associated with educational achievement than is sharing of jokes or riddles. Homes need not emulate classrooms to prepare children for school.

One issue that is addressed by comparing the April and August results is the effect of attending preschool on the home life of children. Parents who have had their children in preschool for the school year have strikingly similar opinions to those whose children are both nine months younger and have not yet started preschool. In addition, the reported actual and preferred ways that the children's time is allocated are quite alike for the

two samples. However, a large difference between the samples is apparent in the reported frequency in home learning experiences. The parents of the younger children, those who have not yet started preschool, note a higher frequency of home learning experiences. This may reflect a recognition that children in preschool are spending less time at home and thus encounter fewer learning experiences there.

The implications of these findings for program development are striking. Intelligence test scores and status measures, such as socio-economic status and birth order, are for the most part educational dead ends. This is not true of behavioral and attitudinal measures. Knowledge of which home behaviors and parental attitudes are associated with educational success provides some guidance to program developers, researchers, administrators, and teachers. The Home Learning Environment Profile is intended to help educators in their selection of teaching materials and effective classroom instructional methods, to provide useful background information for interpreting educational test scores, and to enrich communication between parents and educators.

That we have focussed on the educational aspects of home life in the Profile does not mean that we believe that families are important only as places where children acquire educational competencies. Obviously, home life has many functions. Families provide children with a base of security, love, self-esteem, cultural heritage, and family identity. Home is not school, nor do we think it should be. However, by understanding the configuration of the home environment unique to each child, and by working with the family to build upon the strengths of that configuration, it may be possible to create enduring and powerful educational effects.

The Home Learning Environment Profile has been developed using a self-

selected, relatively small population of ethnic-Hawaiian families. We anticipate collecting more data from a larger, more diverse population. With such data we hope to study further the reliability of our measures, as well as to identify the unique features of Hawaiian families.

To point out that certain educational aspects of home life are linked to school achievement does not imply that all families should be similar. Our view is just the opposite. We believe that the learning experiences of children can be improved within the context of ethnic and social diversity. We also believe that each person's home is a refuge, deserving privacy and respect. We hope that the work begun here will be useful in understanding and building upon the home environment to enhance the education of Hawaiian children.

References

Caldwell, B. M., & Bradley, R. H. (1984). Home observation for measurement of the environment (Revised ed.). Little Rock: University of Arkansas at Little Rock.

Cattell, R. B. (1983). The role of psychological testing. In R. B. Cattell (Ed.), Intelligence and national achievement (pp. 19-69). Washington, DC: Institute for the Study of Man.

Clark-Stewart, K. A. (1978). Evaluating parental effects on child development. Review of research in education, 6, 47-119.

Dunn, L. M., & Dunn, L. M. (1981). Peabody picture vocabulary test-revised manual. Circle Pines, MN: American Guidance Service.

Dunn-Rankin, P. (1983). Scaling methods. Hillsdale, NJ: Erlbaum Associates, Inc.

Educational Testing Service. (1976). CIRCUS. Menlo Park, CA: Addison-Wesley Publishing Company.

Gallimore, R., Boggs, J., & Jordan, C. (1974). Culture, behavior, and education. Beverly Hills, CA: Sage.

Goodson, B. D., & Hess, R. D. (1978). The effects of parent training programs on child performance and parent behavior. In B. Brown (Ed.) Found: Long-term gains from early intervention (pp. 37-78). Boulder, CO: Westview Press.

Gottfried, A. W. (Ed.). (1984). Home environment and early cognitive development: Longitudinal research. Orlando, FL: Academic Press.

Heath, R. W. (1987, May). Statistical barbarisms in the reporting of educational data. Paper presented at the meeting of the American Statistical Association (Hawaii Chapter), Honolulu.

Heath, R. W., & Plett, J. D. (1986). The identification of priority sites for parent-child services. Honolulu: Kamehameha Schools/Bernice Pauahi Bishop Estate.

Henderson, R. W., Bergan, J. R., & Hurt, M. (1972). Development and validation of the Henderson Environmental Learning Process Scale. Journal of Social Psychology, 88(2), 185-196.

Howard, A. (1974). Ain't no big thing. Honolulu: University of Hawaii Press.

Johnson, O. G. (1976). Tests and measurements in child development: Handbook II. San Francisco: Jossey-Bass.

Jordan, C., D'Amato, J., & Joesting, A. (1981). At home, at school, and at the interface. Educational Perspectives, 20(1), 31-37.

Laosa, L. M. & Siegel, I. E. (1982). Families as learning environments for children. New York: Plenum.

Leichter, H. J. (Ed.)(1974). The family as educator. New York: Teachers College Press.

Levin, P. F. & Brenner, M. E. (1987). Early literacy and numeracy experiences of young Hawaiian children. Unpublished manuscript.

Levin, P. F., Brenner, M. E., & McClellan, J. M. (1987). The social context of early literacy in Hawaiian homes. Unpublished manuscript.

Linnekin, J. (1985). Children of the land: Exchange and status in a Hawaiian community. New Brunswick, NJ: Rutgers University Press.

Mitchell, J. V., Jr. (1983). Tests in print, III. Lincoln, NB: University of Nebraska Press.

Mitchell, J. V., Jr. (1985). The ninth mental measurements yearbook. Lincoln, NB: University of Nebraska Press.

Norusis, M. J. (1985). SPSS-X advanced statistics guide. New York: McGraw-Hill.

Plett, J. D. & Heath, R. W. (1987). Hawaiian early childhood data book. Honolulu: Kamehameha Schools/Bernice Pauahi Bishop Estate.

Pukui, M. K., Haertig, E. W., & Lee, C. A. (1972). Nana i ke kumu (Look to the source) (Vol. 1). Honolulu: Hui Hanai, an Auxiliary of the Queen Lili'uokalani Children's Center.

Radin, N. & Epstein, A. S. (1975). A questionnaire for fathers on home stimulation of preschoolers. Unpublished manuscript.

Scott-Jones, D. (1984). Family influences on cognitive development and school achievement. Review of research in education, 11, 259-304.

Tibbetts, K. A. & Heath, R. W. (1987, January). College Board performance: Hawaii the least literate State relative to resources. Paper presented at the meeting of the Hawaii Educational Research Association, Honolulu.